FocusPro
User's Manual

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Last revision date: 10-Sep-2013
For FocusPro Software/Firmware 1.00.000 or greater

This document can be ordered as Astrometric Instruments' part number DOC-16

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1. Introduction

FocusPro provides precise absolute focus control for astronomical telescopes. FocusPro provides ASCOM compliancy and an optional handpaddle for manual at-telescope control.

This document details FocusPro-CA, which is designed for custom applications which provide a bipolar stepper motor, home index switch and optional limit-of-travel switches.

2. Features

- In/out limit of travel sensing
- Temperature sensing
- Programmable step rates/accelerations
- Selectable maximum motor current rating (available choices are 0.9A and 2.0A… specify this when ordering)
- PC-based user interface software (FocusPro.exe) included
- 100% compliant ASCOM Focus interface

Figure 1: FocusPro module topology
(note pin 1 on Removable Terminal Block)

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3. Installation

3.1. Mounting

It is recommended that the FocusPro-CA unit be mounted where there is a nominal air space around the unit for cooling airflow. It is also nominal if the unit is mounted to metal or other heat-conducting material. The unit will not dissipate very much heat however if there is no airflow and/or an insulated mounting then the electronic temperatures may get too high.

3.2. Connection diagram

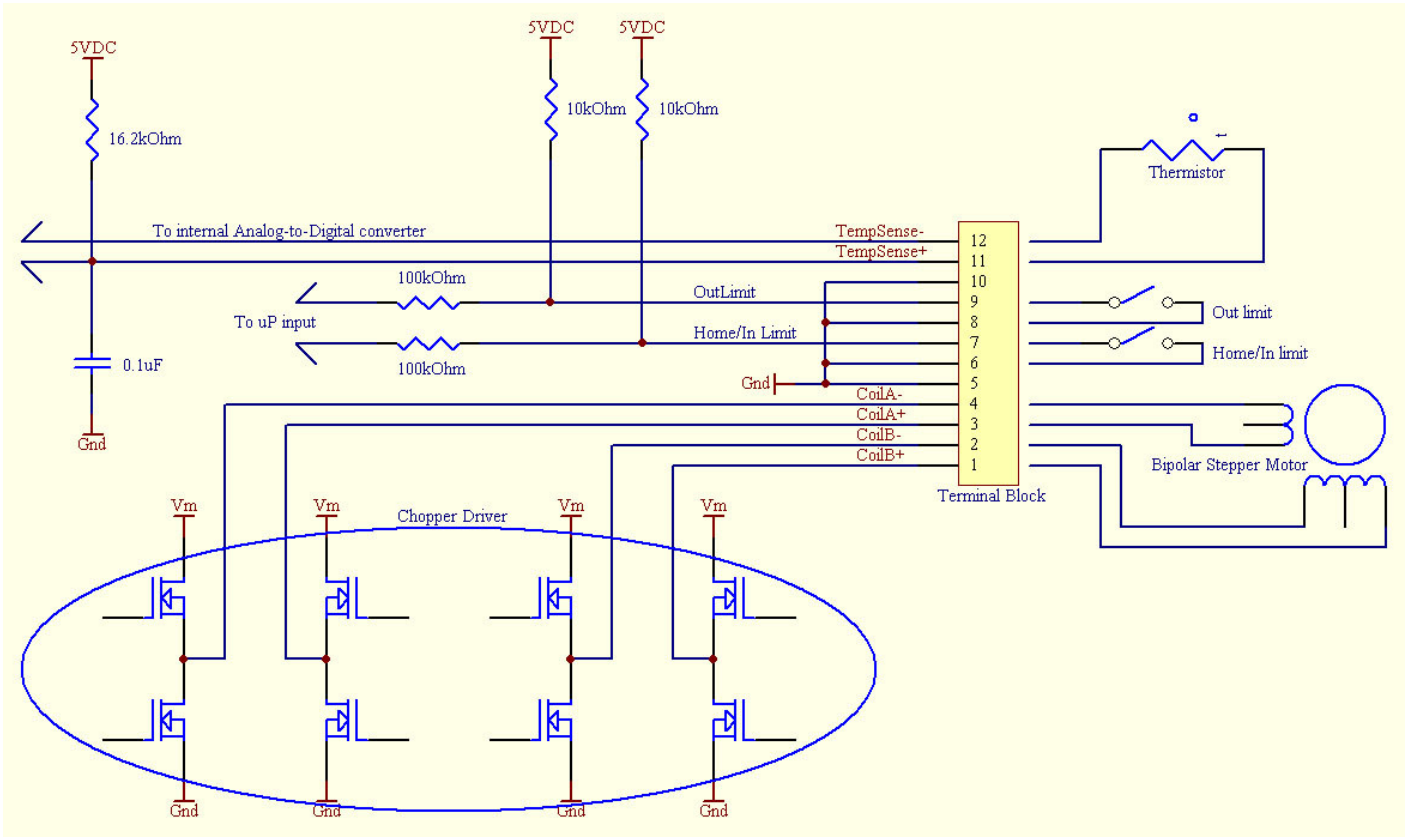

Figure 2: FocusPro connection diagram

3.3. Wiring connections

3.3.1. Motor

FocusPro drives bipolar stepper motors in a "microstepping" mode where each full-step is divided into 32 microsteps. With a standard 200 full-steps/rev stepper motor this provides 6,400 microsteps/rev.

Any bipolar stepper motor should work with FocusPro however lower performance (high inductance) motors can potentially "sing" when operating since the high inductance of these motors can cause FocusPro's internal Chopper Driver (see figure 2) to operate at lower/audible frequencies.

The maximum current provided per motor coil (phase) is hardwired inside FocusPro. There are two choices: 0.9A and 2.0A. The current rating is labeled on FocusPro's enclosure.

Connect the bipolar stepper motor to the Terminal Block as shown in figure 2. If the motor leads exceed 10" it is recommended that the positive and negative wires on each coil are twisted together to minimize the generation of electrical noise.

3.3.2. Power supply

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FocusPro has two internal power supply connections: Vm and Vs. Vm is the motor supply and Vs is the control/logic supply. There is an internal Pwr jumper (figure 3) which shorts these two power supplies together. Use the following table to determine if the jumper should be installed or removed (by default it is installed):

Case	Usage	Power shorting jumper
1	FocusPro is used stand-alone and not connected to SkyWalker.	Installed
2	FocusPro is connected to SkyWalker and a) the max motor coil current is less than 1A and b) SkyWalker's 12VDC (nominal) power supply is sufficient to drive the motor.	Installed
3	FocusPro is connected to SkyWalker and either the motor coil current is set to >1A or the motor requires more than 12VDC.	Removed

Table 2: Power shorting jumper usage

Note: for case #1 and case #3 a power supply must be connected to the Pwr connector (lower left in figure 1). The cable shipped with FocusPro provides flying-leads to connect to the positive and negative terminals of the power supply. FocusPro accepts a power supply voltage between 12V and 28V. A 4A supply is sufficient for motors to 2A.

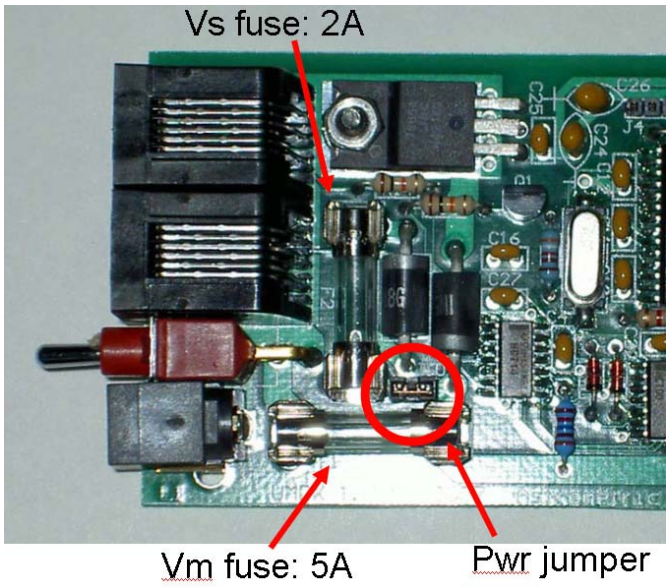

Figure 3: internal Pwr jumper and fuses

Fusing and reverse voltage protection is provided internal to the FocusPro unit. Reverse voltage (no greater than -28V) will not damage the unit however it will likely burn-out one or both of the input protection fuses (see specifications section for fuse details).

3.3.3. Home/In limit switch

A switch that engages when the focuser is at its point of maximum inward travel must be connected between pins 7 and a Gnd pin (e.g. pin 6) on the Terminal Block. This switch must be normally-opened or normally-closed however it must be the same type as the Out limit switch. The type of limit switch is specified with the "Limits polarity positive" selection on the FocusPro software:

- When checked, the limits (both the Home/In limit and the Out limit) are valid when the limit switches are OPEN and the limit inputs are pulled to 5VDC internal to FocusPro.

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- When un-checked, the limits (both the Home/In limit and the Out limit) are valid when the limit switches are CLOSED and the limit inputs are pulled to Gnd through the switch.

This switch is not optional since FocusPro needs a home position to reference focus position however the in-limit function of this switch can be disabled by configuration switch #2 (see table 1) for use with continuous-rotation cam focusers that have no in-limit.

3.3.4. Out limit switch

A switch that engages when the focuser is at its point of maximum outward travel can optionally be connected between pins 9 and a Gnd pin (e.g. pin 8) on the Terminal Block. This switch can be either normally-opened or normally-closed however it must be the same type as the Home/In limit switch. The type of limit switch is specified with configuration switch #1 (see table 1). This switch is optional and can be disabled by configuration switch #2 (see table 1) for use with continuous-rotation cam focusers that have no out-limit.

3.3.5. Temperature probe

FocusPro's temperature sensor board, when attached to the TempSense+/TempSense- inputs on the Terminal Block, provides direct temperature sensing through FocusPro software.

3.3.6. RS232 interface to client PC

The RS232 port (see figure 1) accepts a standard 4-wire Astrometric COM cable. Note: the RS232 connection to a client PC cannot be used simultaneously with the TCS connection to SkyWalker. Configuration switch #3 (see table 1) must be On to enable RS232 communications.

The RS232 interface provides connection between FocusPro hardware and FocusPro software and when upgrading FocusPro's firmware.

3.3.7. TCS bus connection

The two Telescope Control System (TCS) ports (labeled TCS1 and TCS2 in figure 1) accept standard 6-wire Astrometric TCS cables. Either port can be used to connect to SkyWalker or onwards to other peripherals in a daisy chained configuration. Note: the TCS connection to SkyWalker cannot be used simultaneously with the RS232 connection to a client PC. The TCS interface provides connection to FocusPro (through SkyWalker) when used with Maestro software.

Configuration switch #3 (see table 1) must be Off to enable the TCS connection to SkyWalker.

3.4. Power up

When powered-up the stepper motor connected to FocusPro may "sing" slightly. It will not be able to be moved unless FocusPro is connected to FocusPro.exe (see below), SkyWalker or the optional handpaddle is installed. The Status LED (figure 1) will light as follows:

On continuous: device error (inoperable)

Mostly on with short blink off: operating properly but no communications (to SkyWalker or FocusPro software) detected within the last second.

Mostly off with short blink on: operating properly and communications (to SkyWalker or FocusPro software) detected within the last second.

4. Using FocusPro software

4.1. Installation

4.1.1. Software installation

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Run the FocusProM_NN_RRR.exe program, where "M_NN_RRR" is the version number of the present software release. By default, this will install the following files in c:\Program Files\Astrometric\FocusPro:

- FocusPro.exe: the FocusPro executable file. Create a short-cut to this file on your Desktop, Quick Launch bar or Start Menu.
- FocusProRegister.bat & FocusProRegister.vbs … see next subsection
- Setup.vbs… see Setup section below

4.1.2. ASCOM registration

To enable FocusPro's ASCOM interface FocusPro.exe must be "registered" with ASCOM as a Focuser driver. To do this, first double click on FocusProRegister.bat and then FocusProRegister.vbs (in that order) to run them. Once this is completed FocusPro.exe will be registered as an ASCOM Focuser driver and available from client software applications as "FocusPro by Astrometric Inst.".

4.2. Startup

Follow these steps to startup FocusPro software:

1. Assure that a serial port connection exists between the PC running FocusPro software and FocusPro's COM input (figure 1).
2. Turn-on FocusPro hardware
3. Start FocusPro software on the PC
4. Under the "Setup" group, select the COM Port that connects to the hardware.

At this point the hardware and software should be connected. Press the Out, In and Halt buttons to assure that the focus motor works.

4.3. Setup

The following one-time settings need to be made for normal operation:

- Motor step ratio: this specifies the number of real motor steps issued/reported for each motor step commanded/displayed. For example, if this is set to 10 then a GoTo of 200 will result in the motor being moved to a step position of 2000.

5. Specifications

Size

- 6.05" x 2.20" x 1.00"

Power Supply

- Vm: 10.8VDC to 28VDC
- Supply current
  - Typical for 0.9A motor slewing: 350mA
  - Typical for 2.0A motor un-loaded slewing: 1.1A
  - Max: 4.0A

Internal Fusing

- Motor supply fuse: 5x20mm fast-blow 5A. Installed per figure 3.
- Logic supply fuse: 5x20mm fast-blow 2A. Installed per figure 3.

Environmental Requirements

- -20C to 50C ambient
- 5% - 95% relative humidity, non-condensing

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